December 1999

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Abstract

Information systems have focussed on controlling the decision-making environment, whereas in real life groups operate in an uncontrolled, asynchronous environment. In this paper we examine existing information system research on groups, analyze the role played by the process environment on the quality of group decisions, and argue the need for information systems for uncontrolled dynamic environments.

Introduction

Research on groups has been conducted for over fifty years. In recent years, information systems are being developed to help groups make better and quicker decisions. Group Decision Support Systems are systems that provide tools and techniques that improve group decision making. These systems control every aspect of the decision-making environment. But, in "real life" a number of the so-called group environments involve groups operating in an uncontrolled, asynchronous environment. While these controlled environments have led to the design of systems which increase decision making quality, and reduce time, research on uncontrolled decision making process environment has been inconclusive. In this paper we examine existing information system research on groups, and analyze the role played by the process environment on the quality of group decisions.

Types of Systems

We considered two types of systems for group decision making in this study: systems that control the process environment and those that do not control the decision-making environment. The two types of systems are described below.

Systems using a controlled environment

As mentioned earlier, Group Decision Support Systems (GDSS) control the process environment in which groups make their decisions. A GDSS is a computer-based information system used to support intellectual collaborative work (Jessup and Valacich, 1991). Ellis, Vogel and Nunamaker (1989) defined GDSS or Groupware as computer based systems that support groups of people engaged in a common task or goal, and that provide an interface to a shared environment. The purpose of a GDSS is to improve the process of decision making by removing common communication barriers, providing techniques for structuring decision analysis and systematically directing the pattern, timing, or content of discussion. In group decision making, communication activities exhibited include proposal exploration, analysis, expressions of preference, argumentation, socializing, information seeking, information giving, proposal development, and proposal negotiation (DeSanctis and Gallupe, 1987).

Systems using a dynamic environment

Early research in the area of information systems for group decision making did not attempt to control the process environment in which groups made their decisions. Studies conducted were experimental in nature, using business games. Human subjects played the role of managers who made decisions in a simulated business environment. Decision Support Systems created for these studies allowed a dynamic process environment for groups to make decisions, i.e., these systems did not control the communication flows and patterns, and decision-making tools within the group. This is the basic difference between systems using a dynamic environment and GDSS.

Analyzing Group-based Information Systems Research

Pinsonneault and Kraemer (1990) provided a framework for analyzing group based information systems research. We use this framework to analyze all types of research using information technology in groups, and to determine the role of the process environment on group decision making. This framework is based on many factors or variables. The factors can be classified

into three main types: context related factors, process related factors and outcome (of group interaction) related factors. Their framework and much of the MIS research in this area, focuses on identifying the effects of information systems on group processes while controlling the effects of other contextual variables.

In the framework, contextual variables are the factors that consider the immediate environment of the group rather than the broader organizational environment. Group process variables are those factors that refer to characteristics and dynamics of interaction within a group. Outcome variables refer to the results of group interaction and the performance of groups.

Contextual variables are of five types: personal factors, situational factors, group structure, technological support and task characteristics. Personal factors include attitudes, behaviors and motives of individual group members. Situational factors consider the relationships and social networks among members of the group and characteristics of the development of the group. Group structure includes work group norms, power relationships, and other patterned relationships among members of the group. The activities supported by electronic meeting systems and the extent of support provided are considered in technological support. Task characteristics include attributes of the group's substantive work.

There are four important types of group process variables. Decision characteristics consider how group decisions are made. Communication characteristics focus on the process of information exchange within the group. Interpersonal characteristics consider the degree of 'fit' between members of the group. The degree of standardization of group processes is considered in the structure of group processes. The group process variables affect group outcomes. Outcome variables have two components: task related outcomes which include the characteristics of decisions made by the group, and group related outcomes which consider the perception of group members about group processes and dynamics.

Here we use the Pinsonneault and Kraemer (1990) model to analyze the differences between systems emphasizing a controlled environment and systems allowing a dynamic process environment, and their impact on group processes and outcomes.

Group Processes

Pinsonneault and Kraemer cited findings by George, et al (1990), Nunamaker, Applegate and Konsynski (1987, 1988), and Vogel and Nunamaker (1988), which stated that participation is more equal with less domination by one or more members in groups which use GDSS. The extent to which group members focus their efforts on the task has been measured by task oriented communication and clarification of efforts of group members. Gray (1972), and Nunamaker et al. (1988) have found an increase in such communication in studies. Steeb and Johnson (1981) reported that GDSS groups had greater decision comprehensiveness and considered a larger range of options or alternatives. Studies by Steeb and Johnson (1981), Vogel and Nunamaker (1988), showed that more GDSS supported groups reached consensus than non-supported groups. Most studies in this area have found evidence that GDSS supported groups took less time to arrive at a decision (Bui , Sivasankaran, Fijol and Woodbury, 1987; Nunamaker et al.,1988, 1989; Vogel and Nunamaker, 1988). GDSS supported groups perceived lower amounts of issue-based and interpersonal conflict than control groups (Miranda and Bostrom, 1994).

A number of studies have looked at information systems for groups operating in a dynamic environment. In a study of three different problem-solving techniques in groups, Affisco and Chanin (1990) used DSS technology for two of the techniques. They reported that there were no significant differences in conflict handling among the various groups (DSS versus non-DSS, problem solving technology versus control). Another area of interest in group processes is information usage within groups. While a number of studies have investigated the amount of information provided and performance of groups, few studies have examined the relationship between use of information and performance.

In an experiment that evaluated the relationship of uncertainty in the environment to information used by decision makers, Schroeder and Benbasat (1975) found that groups used more information in the form of reports as environmental uncertainty, but information usage decreased for groups operating in the most variable environment. O'Reilly (1982), in a field study regarding the use of information sources, found that as the quality and accessibility of information sources increase, so does the frequency of their use. This research also confirmed the Schroeder and Benbassat (1975) finding that information usage increases with increase in environmental uncertainty.

Outcomes

According to Pinsonneault and Kraemer (1990), GDSS increase decision quality. Studies by George et al. (1988), Bui et al. (1987), Steeb and Johnson (1981) found that GDSS supported groups performed better than non-supported groups. According to Nunamaker et al. (1988), Steeb and Johnson (1981), Vogel and Nunamaker (1988), GDSS increase the confidence of group members in their decisions, and satisfaction of members with the group decision.

Among the outcome variables, performance of groups has been the most widely studied variable. A few studies have examined the effect of computer-based decision making in a business gaming environment. Results have been mixed. Using systems which allowed for a dynamic process environment, Keys, Burns, Case and Wells (1988) found that the use of computer based work sheets led to only marginal improvement in performance over the use of hand scored work sheets. On the other hand, Affisco and Chanin (1989) found no significant relationship between the use of DSS and group performance, i.e., groups using DSS did not outperform non-DSS groups.

Conclusion

We can conclude that there are significant differences in research findings for group decision making systems using a controlled environment and those using a dynamic environment. GDSS using a controlled environment provide significant benefits in the quality of decision made and time required to make a decision. On the other hand, results obtained from research on systems which do not control the process environment like GDSS do, were inconclusive. This is cause for concern since a large portion of decision making done in organizations is done in a dynamic and asynchronous environment. We recommend there is need for more research in this area.

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